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New species of Uredineae—VIII*

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In continuing the monographic work on the rusts for the North American Flora it is found that apparently the following species have not been described. In order to place these species on record and to add such incidental information as may be at hand a brief account of the several forms is here presented.

***Puccinia fidelis* sp. nov.**

O. Pycnia hypophyllous, grouped among the aecia, prominent, large, 112–144 μ broad by 65 μ high, with compact ostiolar filaments, reaching as much higher.

I. Aecia hypophyllous and cauliculous, scattered over the plant from a diffused mycelium, causing some hypertrophy and etiolation, chiefly on the woody tissues and hence often in rows along the veins, bullate, large, 0.8–1.3 mm. across, dehiscent by irregular slits, overarching epidermis reddish and prominent; peridium wanting; aeciospores globoid, usually 23–26 μ ; wall nearly or quite colorless, appearing thick, 2–3 μ , coarsely verrucose.

II. Uredinia hypophyllous, scattered, round, small, dark cinnamon-brown; urediniospores globoid, usually 23–25 μ in diameter; wall cinnamon-brown, rather thin, finely echinulate, pores usually inconspicuous, 2 near the hilum.

III. Telia hypophyllous, scattered, round, small, very pale brownish, cinereous by germination; teliospores oblanceolate or fusiform, 17–19 by 50–67 μ , narrowed or obtuse at both ends, upper cell usually shorter and somewhat inverted topshaped; wall nearly or quite colorless, smooth, uniformly thin, 1 μ ; pedicel short, fragile.

On *Hyptis stellulata* Benth., hills near Guadalajara, Mexico, July 21, 1893, C. G. Pringle. The host of this rust was determined at the Gray Herbarium a short time ago. Through the kindness of Mr. A. B. Seymour the very ample original collection was placed at my disposal for study, and all stages of this charac-

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teristic species were easily worked out. All the shoots from the perennial roots of the host are invaded and altered by the gametophytic hyphae, showing that the mycelium probably hibernates in the crown of the plant. The sporophytic phase was not so well represented by the collection, and probably has a limited mycelium.

***Puccinia exornata* sp. nov.**

O. Pycnia amphigenous, in small groups, large but sunken in the tissues and not especially conspicuous, 120–160 μ in diameter, honey-yellow.

I. Aecia hypophyllous, in small groups surrounding the pycnia, on discolored and unthickened spots, roundish, 0.3–0.5 mm. in diameter, ruptured epidermis overarching, conspicuous; peridium wanting; aeciospores globose, 24–27 by 26–32 μ ; wall colorless, 3–5 μ thick, coarsely verrucose with closely set oval beads arranged in longitudinal or slightly spiral series.

II. Uredinia hypophyllous, scattered or somewhat grouped, round, 0.1–0.2 mm. across, soon naked, low, pulverulent, pale cinnamon-brown, ruptured epidermis inconspicuous; urediniospores globose or obovate-ellipsoid, 20–24 by 24–30 μ ; wall thin, 1–1.5 μ , very pale yellow, finely and sparsely echinulate, pores indistinct, apparently 3 and nearly equatorial.

III. Telia hypophyllous, similar to the uredinia but slightly larger and darker in color; teliospores oblong, 19–24 by 37–48 μ , round at both ends, somewhat constricted at septum; wall golden yellow, smooth, 1 μ thick, slightly thicker above, 2–4 μ ; pedicel colorless, slender, once to twice the length of spore.

On *Baccharis thesioides* H.B.K., Guatemala City, Dept. of Guatemala, Guatemala, alt. 1465 m., Feb. 2, 1905, *W. A. Kellerman* 5368. The uredinia and telia of this species are very similar to those of *Puccinia oaxacana* Diet. & Holw., but the aecia are wholly unlike, especially in the absence of a peridium and in the coarsely sculptured and thick-walled aeciospores. The host, *Kellerman* 4375, was determined by Mr. J. Donnell Smith.

***Puccinia egregia* sp. nov.**

O. Pycnia hypophyllous, numerous, especially along the veins, preceding the aecia, inconspicuous.

I. Aecia hypophyllous and cauliculous, abundant, scattered over the whole plant from a diffused mycelium, causing etiolation, at first more numerous along the stems and veins, mostly oval,

large, 0.5–1 mm. across, the prominent peridium soon bursting through the swollen reddish base; peridium cylindrical, or flattened laterally, large, 0.3–0.5 mm. in diameter by 0.5–0.8 mm. high, fragile and somewhat evanescent; aeciospores broadly ellipsoid or globose, 16–21 by 19–26 μ ; wall colorless, thin, 1.5 μ , strongly verrucose with closely set beads.

II. Uredinia not seen; urediniospores mixed with the teliospores, globose, about 23–27 μ in diameter; wall cinnamon-brown, rather thin, 1.5 μ , finely echinulate, pores indistinct, apparently 2 and equatorial.

III. Telia hypophyllous, scattered, round, usually small, 0.1–0.2 mm. across, early naked, loosely pulvinate, becoming pulverulent, chestnut-brown; teliospores ellipsoid or obovate-ellipsoid, 21–27 by 35–45 μ , rounded or somewhat narrowed at base, obtuse or rounded at apex; wall cinnamon-brown, minutely granular, 1.5 μ thick, much thicker at apex by a broad pale umbo, 6–10 μ , often appearing vertically striate; pedicel colorless, delicate, short.

On *Baccharis oaxacana* Greenm., Mt. Oaxaca, Mexico, alt. 2850 m., June 23, 1894, C. G. Pringle. Through the kindness of Mr. A. B. Seymour, I was enabled to examine the large original collection of this species. The host was determined at the Gray Herbarium in February 1911. The aecial mycelium causes a marked change in the host, turning it pale and giving a drawn appearance. The sporophytic stages appear sparingly on the least changed leaves.

***Puccinia sphenica* sp. nov.**

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly hypophyllous, scattered, round, very small, light cinnamon-brown, pulverulent, ruptured epidermis noticeable; urediniospores broadly obovoid, 19–23 by 24–30 μ ; wall tawny or nearly colorless, 1.5 μ thick, minutely and rather closely echinulate, pores indistinct, 3 or 4, equatorial.

III. Telia hypophyllous, scattered, small, pulvinate, chestnut-brown, ruptured epidermis inconspicuous; teliospores ellipsoid, 27–32 by 35–45 μ , rounded at both ends; wall smooth, chestnut-brown, concolorous, 2.5–4 μ thick, thicker above, 4–9 μ ; pedicel often inserted obliquely, nearly or quite colorless, terete, fragile, about once length of spore.

On *Baccharis sordescens* DC., Cuernavaca, State of Morelos, Mexico, Oct. 29, 1903, E. W. D. Holway 5266. From other North

American species of *Puccinia* on *Baccharis* having teliospores smooth, this species is readily separated by the unusually thick walls of the teliospores.

***Puccinia pistorica* sp. nov.**

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, abundant, scattered, roundish, large, for some time partially covered by the overarching epidermis, light cinnamon-brown; urediniospores globose or obovate-globose, 24–32 by 30–39 μ ; wall pale yellowish, about 2 μ thick, sparsely and strongly echinulate, pores very indistinct, probably few and scattered.

III. Telia amphigenous, in compact irregular groups, of varying size from 0.1 to 1 mm. across, chocolate-brown or blackish, usually shining; teliospores linear-oblong or oblong-lanceolate, small, 12–16 by 39–50 μ , obtuse or rounded above, narrowed below; wall smooth, chestnut-brown above, much lighter toward the base, 1–1.5 μ thick at sides, 6–12 μ thick above; pedicel tinted, slender, one-half length of spore or less.

On *Baccharis glomeruliflora* Pers., Mt. Dora, Florida, March 25, 1891, L. M. Underwood. This species is distinct from all other species of *Puccinia* on *Baccharis* that the writer has examined, in the compact and glossy teliosori. The spores show no evidence of germination in the specimen examined. The material in hand, for which I am indebted to Prof. E. W. D. Holway, is scanty, however, and a more extended account must await the collection of better material, which should also supply the pycnial and aecial characters. The locality where the collection was made, as I learn from Mr. P. L. Ricker, is near Lake Dora, on the Tampico and Key West railway, and about halfway between the stations of Tavares and Sorrento. The fungus is not inconspicuous, and is likely to be found throughout southern Florida when searched for.

***Puccinia pagana* sp. nov.**

III. Telia amphigenous, scattered, oval, 0.1–0.4 mm. broad by 0.2–0.7 mm. long, tardily naked, cinnamon-brown, somewhat pulverulent, ruptured epidermis falling away from above the sorus; teliospores oval or oblong, 18–23 by 27–35 μ , rounded or obtuse both above and below, not constricted at septum; wall cinnamon-brown, 1.5–2 μ thick, often slightly thickened above, 3–4 μ , sometimes simulating a pale papilla, finely and inconspicuously verru-

cose, more evidently so above; pedicel colorless, slender, fragile, half length of spore or less.

On *Allium reticulatum* Don, Dead Lake, Pikes Peak, Colo., 3500 meters alt., August 20, 1904, F. E. & E. S. Clements (Clements, Crypt. Format. Color. 141). The collection was issued under the name *P. mutabilis*, but differs from that species in the more oval teliospores without constriction, and with distinctly verrucose surface. No urediniospores are present, not even in the teliosori. Whether urediniospores and aeciospores occur in the life cycle, or not, can not be told or even inferred from the material in hand. Even the material of the host is scanty, showing neither flowers nor bulbs, and some doubt must attach to its correct determination. As it has been impossible to match this material with any other known rust, it is recorded here to attract the attention of collectors.

***Uromyces aemulus* sp. nov.**

O. Pycnia very few, punctiform.

I. Aecia amphigenous, rather closely but irregularly arranged in oval groups 0.5–1 mm. long, on pale unthickened spots, cylindrical, margin erose or somewhat lacerate; aeciospores globoid or irregularly ellipsoid, 20–24 by 23–26 μ , often angular; wall pale yellow, 1.5–2 μ thick, finely verrucose.

II. Uredinia amphigenous, widely scattered, oblong or oval, 0.5–2 mm. long, dehiscent by longitudinal slits, yellow or light cinnamon-brown; urediniospores globoid or broadly ellipsoid, 22–29 by 25–33 μ ; wall golden yellow, 1.5–2 μ thick, inconspicuously echinulate, pores indistinct, 5–8, scattered.

III. Telia amphigenous, scattered, prominent, usually oblong, 0.8–3 mm. long, at first covered by the gray epidermis, eventually naked, somewhat pulverulent, dark chocolate-brown or blackish; stroma absent; teliospores globoid or obovate-globoid, 18–24 by 24–30 μ ; wall chestnut-brown, concolorous, 2–2.5 μ thick, slightly or not thickened above, 2.5–4 μ , smooth; pedicel slender, about once length of spore.

On *Allium brevistylum* S. Wats., Yanceys, Yellowstone National Park, Wyoming, July 17, 1899, A. & E. Nelson 5920 (type). The host was determined by Dr. P. A. Rydberg, January 1907, from the specimen in the cryptogamic herbarium of the New York Botanical Garden. Sori of all spore forms are fairly well represented in this collection. They bear the customary relation

to one another on the leaves of the host that is usual in autoecious species. The following specimens also belong here: on *A. brevistylum* S. Wats., Big Horn Mts., Wyo., August 1898, *T. A. Williams & D. Griffiths*, III; Ten Sleep Lakes, Big Horn Co., Wyo., July 30, 1901, *Leslie N. Goodding* 422, II & III; Hot Sulphur Springs, Colo., 2340 m. alt., July 24, 1907, *E. Bethel*, II & III; on *A. validum* S. Wats., Pine Forest Mts., Nev., July 1901, *Griffiths & Morris*, II & III (*Griff.*, West Am. Fungi 391); and intermixed with *Puccinia Blasdalei* D. & H. on *A. acuminatum* Hook., Farmington Canyon, Davis Co., Utah, June 3, 1904, 1700 m. alt., *A. O. Garrett*, III (*Garrett*, Fungi Utahenses 83).

This species is most easily confused with *Uromyces aureus* D. & H., but that species, which is known only from a single collection made in California on *Allium validum* in 1892, has larger spores, entire absence of urediniospores, and a different disposition of aecia and telia on the leaf, the aecia closely surrounding the groups of telia, and both seemingly arising from the same mycelium.

The type collection was first distributed under the name *Uromyces bicolor* E. & E., and other Wyoming specimens under the name *U. aterrimus* D. & H., which is a synonym of the preceding, but that species, generally at lower levels, has strictly subepidermal telia with well developed stromata, and urediniospores with a larger number of especially distinct pores. In its urediniospore it is similar to the European *U. ambiguus* (DC.) Fckl., but that species has permanently covered telia, and obovate teliospores.

The *Allium* species of *Puccinia* are much given to the production of mesospores, in some sori even to the exclusion of the two-celled spores, but these can be distinguished from the present species by morphological characters. The collection distributed in Garrett's Fungi Utahenses, 83, consists of a mixture of *U. aemulus* and *P. Blasdalei* D. & H. The telia are quite readily separated under a hand lens. Those of the *Uromyces* are grayish and inclined to be naked, while those of the *Puccinia* are quite black and closely covered. The mesospores of the latter have a semihyaline, thickened apex and are not globose.

There has been much confusion in determining the American *Allium* rusts. Most collections are not provided with either flowers or bulbs, which are usually needed to name the hosts, but

fortunately the morphological characters derived from the spores, and the geographical range, afford better diagnostic data than the host species. On the plains between the Mississippi River and the foothills of the Rocky Mountains a number of collections of aecia on *Allium* have been made, which may be placed under the name *Aecidium alliicola* Wint., that may or may not belong to *Puccinia Winteriana* Magn., having uredinia and telia on the grass *Phalaris*. From all that is known of their occurrence and structure, the connection seems probable, the *Allium* and *Phalaris* stages having been collected near each other, although no cultures have been made. Considerable study has recently been given to this group of rusts, and as a result the following key is introduced here to assist collectors.

Key to American and European *Allium* rusts

Teliospores smooth.

Teliospores two-celled (*Puccinia*), often with mesospores.

Teliospores strongly thickened above, 7-10 μ .

Aecia absent.

Urediniospores with 6-8 scattered pores (not in America). *P. Allii*.

Aecia present.

Urediniospores with 6-8 scattered pores. *P. Blasdalei*.

Urediniospores with 3 or 4 equatorial pores (rarely on *Allium*). *P. Asparagi*.

Teliospores not or slightly thickened above, 3-5 μ .

Autoecious, aecia amphigenous.

Telial stromata present, sometimes strongly developed.

Urediniospores with 8-12 scattered distinct pores. *P. granulispora*.

Urediniospores with 7-9 scattered indistinct pores (rare in America). *P. Porri*.

Telial stromata absent.

Urediniospores with 6-8 scattered distinct pores. *P. mutabilis*.

Heteroecious, aecia (on *Allium*) chiefly hypophyllous.

Urediniospores (on *Phalaris*) with 4-6 scattered indistinct pores. *P. Winteriana*.

Teliospores one-celled (*Uromyces*).

Telia tardily naked.

Urediniospores with 6-8 scattered indistinct pores. *U. aemulus*.

Telia permanently covered.

Teliospores not thickened above. *U. aureus*.

Teliospores somewhat thickened above.

Urediniospores with 7-12 scattered distinct pores.	<i>U. bicolor.</i>
Urediniospores with 5-7 scattered indistinct pores (not in America).	<i>U. ambiguus.</i>
Teliospores rough.	
Teliospores two-celled (<i>Puccinia</i>).	
Teliospores coarsely verrucose (rarely on <i>Allium</i>)	<i>P. Calochorti.</i>
Teliospores inconspicuously verrucose.	<i>P. pagana.</i>
Teliospores one-celled (<i>Uromyces</i>).	
Teliospores finely striate (rarely on <i>Allium</i>).	<i>U. primaverilis.</i>
Teliospores coarsely striate (not in America).	<i>U. reticulatus.</i>

***Uromyces probus* sp. nov.**

O. Pycnia not seen.

I. Aecia amphigenous, on the veins in series 1-3 mm. long, short, cupulate, 0.3-0.4 mm. in diameter; peridium erect or spreading, margin erose; aeciospores broadly ellipsoid, 18-21 by 23-26 μ ; wall colorless, about 1.5 μ thick, finely verrucose.

II. Uredinia amphigenous, solitary or in crowded groups 2-8 mm. across, oblong or linear, 0.5-5 mm. long, rather soon naked, light cinnamon-brown; urediniospores broadly ellipsoid, 19-23 by 26-31 μ ; wall golden yellow, 2-3 μ thick, sparsely echinulate with fine short points, pores 5 or 6, scattered.

III. Telia amphigenous, scattered, numerous, oblong or linear, 0.5-4 mm. long, rather tardily naked, chocolate-brown, ruptured epidermis conspicuous; teliospores broadly ellipsoid or obovate-ellipsoid, 16-21 by 23-29 μ ; wall dark cinnamon-brown, about 1.5 μ thick, slightly thicker above, 2-3 μ , smooth; pedicel slightly tinted, usually shorter than spore.

On *Olsynium grandiflorum* (Dougl.) Raf. (*Sisyrinchium grandiflorum* Dougl.), Columbia River, Wash., July 1893, W. N. Suksdorf (Ellis & Ev. N. Amer. Fungi 3137). The type collection was distributed under the name *Uromyces Sisyrinchii* Mont., a name established upon the uredinia of *Puccinia Sisyrinchii* Mont., according to Messrs. Hariot and Sydow (cf. Sydow, Monog. Ured. 1: 601). The only other species of *Uromyces* on *Sisyrinchium* known in either North or South America is the heteroecious species occurring in the eastern United States, *U. Houstoniatus*, which differs conspicuously from the western form not only in having its aecia on an unrelated host, but in the characters of the sori and of the urediniospores and teliospores. Beside the type collection another was made by Mr. Suksdorf on May 24, 1894, but otherwise with same data. A specimen of the same rust was collected on

Sisyrrinchium sp., Lake Waha, Nez Perces Co., Idaho, June 27, 1896, A. A. Heller 3331.

***Uromyces major* sp. nov.**

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, oval or oblong, 0.3–1 mm. long, cinnamon-brown; urediniospores broadly ellipsoid, 19–23 by 21–26 μ ; wall light golden yellow, 2–2.5 μ thick, strongly and evenly echinulate, pores 4, equatorial.

III. Telia amphigenous, similar to uredinia, blackish brown; teliospores broadly ellipsoid, 19–23 by 23–27 μ , usually rounded at both ends; wall chestnut-brown, not concolorous, 2–2.5 μ thick, thicker above, 5–9 μ ; pedicel slightly tinted, 5–7 μ in diameter, once to twice length of spore.

On *Muhlenbergia* sp., near City of Mexico, Mex., Oct. 2, 1896, E. W. D. Holway. The collection on which this species is founded is meager and the host is not fully determined, but the rust seems so distinct from any other species of *Uromyces* on grasses, that I venture to record it as a form hitherto undescribed. It differs from the only other North American species of *Uromyces* on *Muhlenbergia*, *U. minimus* Davis, in the much larger spores, in the not concolorous and thicker-walled teliospores, and in the very different range.

***Uromyces mysticus* sp. nov.**

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly epiphyllous, scattered, oblong or linear, 0.5–1.2 mm. long, rather early naked, golden brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, 24–28 by 27–32 μ ; wall golden yellow, 2–2.5 μ thick, finely and inconspicuously echinulate, pores 8–12, scattered.

III. Telia chiefly hypophyllous, similar to the uredinia, but remaining covered by the epidermis; teliospores angularly obovate, 18–26 by 26–33 μ , rounded or angular above, usually somewhat narrowed below; wall chestnut-brown, moderately and uniformly thick, 2–2.5 μ , finely and inconspicuously verrucose; pedicel light yellow, one-half to once length of spore.

On *Hordeum jubatum* L., Denver, Colo., Oct. 29, 1910, E. Bethel (Barth., N. Amer. Ured. 91). This species is readily distinguished from *Uromyces Hordei* Tracy, a somewhat common and more widely distributed form, by the finely verrucose teliospores, which are not thickened at the apex, and by other less

pronounced differences. A collection on *H. jubatum* made at Provo, Utah, without date, *S. M. Tracy* 712, is the only other material belonging to this species that I have seen. Although the rust is on a very common and widely distributed host, it seems to be rare or restricted in its distribution. Possibly it has been overlooked by collectors, owing to its being rather inconspicuous. Without examination under the microscope it might readily be mistaken for the common subepidermal *Puccinia* on the same host, which goes under the name *P. rubigo-vera*.

***Uromyces agnatus* sp. nov.**

II. Uredinia chiefly hypophyllous, scattered, often confluent, irregularly roundish, 0.2–0.5 mm. across, early naked, soon aplanate, somewhat waxy, light cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, 18–23 by 21–29 μ ; wall light golden brown, rather thick, 2–2.5 μ , sparsely and inconspicuously echinulate, pores usually distinct, 2, opposite and equatorial.

III. Telia chiefly hypophyllous, scattered, roundish, 0.1–0.4 mm. across, at first bullate, soon naked, pulverulent, dark chocolate-brown; teliospores oval, somewhat narrowed above and below, 23–29 by 29–35 μ ; wall chestnut-brown, 3–4 μ , slightly thicker above, 5–7 μ , coarsely and inconspicuously verrucose; pedicel colorless, slender, fragile, about length of spore.

On *Jatropha stimulosa* Michx., Dunedin, Fla., Nov. 26, 1901, *S. M. Tracy* 7278 (type); Sanibel Island, Fla., May 17, 1901, *S. M. Tracy* 7234; Summerville, S. C., Aug. 13, 1902, *C. L. Shear* 1553; Lake Worth, Fla., July, 1894, *P. H. Rolfs* 17; Jensen, Fla., no date, *P. H. Rolfs* 55. This species has been confused with the wholly distinct Mexican species on *Jatropha*, *Uromyces oaxacanus* D. & H. In Sydow's Monog. Ured. 2: 183, the description under *U. oaxacanus* is chiefly that of the northern species. In Mexico there is still a second distinct species on *Jatropha*, *U. Jatrophae* D. & H.

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